CLAIMS

What is claimed is:

1. A catalyst performance diagnostics system, comprising:

a plurality of treatment devices;

a plurality of gas sensors disposed in fluid communication with said plurality of treatment devices; and

an on-board diagnostic system coupled to said plurality of gas sensors.

2. The catalyst performance diagnostics system of Claim 1, wherein said plurality of treatment devices further comprises a treatment device selected from the group consisting of catalytic converters, particulate matter filters, emission control devices, and combinations comprising at least one of the foregoing treatment devices.

3. The catalyst performance diagnostics system of Claim 1, wherein said plurality of gas sensors further comprises a gas sensor selected from the group consisting of switch type, wide range air/fuel ratio, linear air/fuel ratio, lambda, and combinations comprising at least one of the foregoing gas sensors.

4. The catalyst performance diagnostics system of Claim 1, further comprising a gas sensor disposed before said plurality of treatment devices.

5. The catalyst performance diagnostics system of Claim 1, further comprising a gas sensor disposed after said plurality of treatment devices.

6. The catalyst performance diagnostics system of Claim 1, further comprising a gas sensor disposed between said plurality of treatment devices.

7. The catalyst performance diagnostics system of Claim 1, further comprising a gas sensor disposed within a treatment device.

8. The catalyst performance diagnostics system of Claim 1, further comprising a first gas sensor disposed before a first treatment device, a second gas sensor disposed between a second treatment device and a third treatment device, and a third gas sensor disposed after a third treatment device.

9. The catalyst performance diagnostics system of Claim 1, wherein said plurality of treatment devices, said plurality of gas sensors, and said on-board diagnostic system are disposed within an exhaust system of a direct injection gasoline system, lean burn system, or diesel system.

10. A method for monitoring catalyst performance, comprising:

introducing an exhaust gas stream into an exhaust system;

monitoring said exhaust gas stream using a plurality of gas sensors;

passing said exhaust gas stream through a plurality of treatment devices;

measuring a response time differential between said plurality of gas sensors; and

desulfating said treatment devices.

11. The method of Claim 10, further comprising monitoring said plurality of gas sensors using an on-board diagnostic system.

12. The method of Claim 10, wherein said desulfating further comprises adjusting an air to fuel ratio to regenerate a catalyst material of one or more of said treatment devices.

13. The method of Claim 10, wherein said measuring further comprises collecting a plurality of responses by an on-board diagnostic system, wherein said responses further comprise a response time differential between a first gas sensor and a second gas sensor, a response time differential between said second gas sensor and a third gas sensor, and a response time differential between said first gas sensor and said third gas sensor.

14. The method of Claim 10, further comprising calculating a sulfur contamination index based upon said response time differentials between said plurality of gas sensors.

15. The method of Claim 14, wherein said measuring further comprises measuring said response time differentials between said gas sensors to calculate a sulfur contamination index.

16. The method of Claim 14, wherein said three sulfur contamination indices further comprise a first sulfur contamination index based on a first gas sensor and a third gas sensor, a second sulfur contamination index based on a second sensor and said third sensor, and a third contamination index based on said first sensor and said second sensor.

17. The method of Claim 10, further comprising measuring a nitrogen oxide storage capacity of one or more of said treatment devices.

18. The method of Claim 17, further comprising determining a nitrogen oxide conversion efficiency of said one or more treatment devices.

19. The method of Claim 18, further comprising using said nitrogen oxide conversion efficiency of said one or more treatment devices to determine whether said treatment devices are experiencing sulfur poisoning.

20. A method for monitoring and treating emissions breakthrough in an exhaust system, comprising:

introducing an exhaust gas stream into an exhaust system;

passing said exhaust gas stream through a plurality of treatment devices;

passing said exhaust gas stream through a plurality of gas sensors;

monitoring said exhaust gas stream using said plurality of gas sensors;

adjusting an air to fuel ratio;

detecting an emissions breakthrough;

adjusting said air to fuel ratio; and

catalytically treating said emissions breakthrough using said treatment devices.

21. The method of Claim 20, wherein said detecting further comprises detecting a rich air to fuel ratio passing through a treatment device.

22. The method of Claim 20, wherein said monitoring further comprises measuring a response time differential between at least two sensors.

23. The method of Claim 22, wherein said measuring further comprises detecting an adjustment in said air to fuel ratio of said exhaust gas stream.

24. The method of Claim 22, wherein said detection further comprises adjusting said air to fuel ratio from a lean air to fuel ratio or stoichiometric air to fuel ratio to a rich air to fuel ratio.

25. The method of Claim 22, wherein said detecting further comprises detecting carbon monoxide.